REMARKS

Reconsideration and allowance of the above identified patent application are hereby requested. Claims 1-26 are pending. Claims 1, 12, 19, 22, and 23 are in independent form. Claims 2-4, 21-22, and 24-26 have been amended to correct typographical errors. Claims 2-4, 21, and 24-26 have been amended to correct typographical errors and not to overcome rejections. Claim 27 is new based on the original specification. No new matter has been added.

Claim Objections

Claims 24-26 stand objected to because they recite dependency on claim 22, which does not have a reader head to provide antecedent basis for the claims. Claims 24-26 have been amended to depend on claim 23. Applicants therefore respectfully request the objection be withdrawn.

Claim 11 is objected to for being dependent on rejected claim 1. Applicants respectfully disagree for the reasons set forth below that claim 1 is not allowable. Applicants therefore respectfully request the objection be withdrawn.

Rejection Under 35 U.S.C. § 101

Claims 22 stands rejected under 35 U.S.C. § 101 as allegedly being directed to non-statutory subject matter. Claim 19 stands allowed, but the Office (Action of May 30, 2008 at page 3) raises concerns that claim 19 is directed to non-statutory subject matter as well.

CLAIM 19

The Office (Action of May 30, 2008 at page 3) alleges that claim 19 does not provide a useful, tangible, or concrete result. Applicants respectfully disagree.

The MPEP provides that an invention is useful if its utility is "(i) specific, (ii) substantial and (iii) credible." MPEP § 2106.IV.C.2.A. Claim 19's invention can be used for at least one credible, "particular practical purpose," namely as part of a speaker identification or verification system as disclosed in the written description at ¶ 0007. Therefore, claim 19 satisfies the utility

requirement imposed by MPEP § 2107.II.B.1. Claim 19 also provides a tangible result because the practice of the invention in claim 19 is tied to an apparatus, namely a computer storage device or computer server storing a database having voiceprints of known speakers and a device, such as a microprocessor, for comparing a voice print of an unknown speaker to the database to determine if there is a match. MPEP § 2106.IV.C.2.B. The practice of the invention in claim 19 produces a real-world result as well, namely a determination of whether a specific database contains a voiceprint that matches that of the unknown speaker. *Id.* Furthermore, Claim 19 provides a concrete result, namely a process that is substantially repeatable. MPEP § 2106.IV.C.2.C. The written description at ¶ 0054-56 describes multiple successful repetitions of substantially the method described in claim 19 while verifying the robustness of the topological approach to speaker recognition.

CLAIM 22

The Office (Action of May 30, 2008 at page 3) alleges that claim 22 is directed to an abstract idea that does not fulfill the statutory requirement of 35 U.S.C. § 101. Claim 22 has been amended to recite statutory subject matter. The amendment is supported by ¶ 0048 of the written description.

Claim 22 also provides a useful, tangible, and concrete result. Claim 22's invention can be used for at least one credible, "particular practical purpose," namely as part of a speaker identification or verification system as disclosed in the written description at ¶ 0007 and is thus useful. MPEP § 2106.IV.C.2.A. Claim 22 also provides a tangible result because the practice of the invention in claim 22 is tied to an apparatus, namely a storage medium that stores a set of rational numbers characterizing topological features of spectral functions. MPEP § 2106.IV.C.2.B. The practice of the invention in claim 22 produces a real-world result as well, namely providing a voice print for identifying a speaker from other speakers.*Id.* Furthermore, Claim 22 provides a concrete result, namely a process that is substantially repeatable. MPEP § 2106.IV.C.2.C.

For at least these reasons, claim 22 is patentable.

Rejection Under 35 U.S.C. § 102

Claims 1-3 stand rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by U.S. Patent Application Ser. No. 2002/0152078 A1 by Yuschik and Slezak (hereinafter "Yuschik"). Applicants respectfully disagree.

CLAIM 1

Claim 1 recites "A method for determining an identity of a speaker by voice, comprising: extracting a set of topological indices from an embedding of spectral functions of a speaker's voice; and using a selection of the topological indices as a biometric characterization of the speaker to identify and verify the speaker from other speakers."

The Office (Action of May 30, 2008 at page 4) asserts that Yuschik discloses a set of topological indices from an embedding of spectral functions of a speaker's voice at ¶¶ 0009 and 0055; the Office (Action of May 30, 2008 at page 4) actually references ¶ 0099, but no such paragraph exists in Yuschik and ¶ 0009 contains the quoted material so Applicants assumes throughout this response that ¶ 0009 was intended.

Based on the above understanding, Applicants respectfully disagrees with the contentions made by the Office (Action of May 30, 2008).

Yuschik (¶ 0009) discloses:

> [t]he parameters of a voice template quantify certain biometric characteristics of the speaker's voice, such as amplitude, frequency spectrum and timing, while the speaker utters the predetermined word or phrase.

Yuschik, however, is silent with respect to taking an embedding of spectral functions. Yuschik also fails to teach extracting a set of topological indices from an embedding of spectral functions. Yuschik describes using metric properties of an utterance in a "voiceprint identification systems" (¶ 0055). In this regard, Yuschik (¶ 0037) discloses that "[f]eatures such as pitch, pitch rate change, high frequency captured, glottal waveform, and temporal duration of sound events can be detected for use as a passcode." Yuschik's metric properties are very different from topological properties of an utterance as recited in claim 1. Topological analysis involves

techniques such as "captur[ing] the main morphological features of orbits regardless of slight deformations." Application Ser. No. 10/568,564 at ¶ 0034. All of features described in Yuschik (¶ 0037) are thus metric characteristics as opposed to the topological indices of claim 1.

Accordingly, Yuschik does not teach, suggest, or motivate extracting topological indices from an embedding of spectral functions of a speaker's voice.

The Office (Action of May 30, 2008 at 4) further contends a voiceprint inherently provides indices of the parameters. Applicants respectfully disagree.

A voiceprint is a representation of the characteristics of a speaker's voice that uniquely identifies that speaker. What that representation captures varies amongst techniques. For example, the voiceprints based on Yuschik's disclosure at ¶ 0037 differ from the voiceprints based on the teachings of U.S. Patent No. 5,313,556 to Parra. A voiceprint therefore does not necessarily provide topological or any other type of indices and thus does not inherently provide topological indices. See MPEP § 2163.07(a).

In addition, Yuschik fails to disclose or otherwise suggest how to extract topological indices. In fact, Yuschik does not even mention "topology" and "topological" in the disclosure.

Therefore, the Office's contention completely lacks support in Yuschik.

The Office (Action of May 30, 2008 at page 4) additionally asserts that Yuschik (¶¶ 0009 and 0057) discloses using a selection of the topological indices as a biometric characterization of the speaker to identify and verify the speaker from other speakers as recited in claim 1. Once again, Applicants respectfully disagree.

As discussed above, Yuschik (¶0009 and ¶ 0037) only describes using metric properties as biometric characteristics for speaker-dependent identification and verification. Thus, Yuschik does not teach, suggest, or motivate using topological indices as a biometric characterization.

For at least these reasons, claim 1 is patentable over Yuschik. Claims 2-11 depend from claim 1 and thus are patentable for at least the reasons discussed with respect to claim 1.

CLAIM 2

Claim 2 recites "[t]he method in claim 1, further comprising: analyzing a voice sample from a second speaker to extract a set of topological indices for the second speaker; comparing the set of topological indices for the second speaker to the set of topological indices for the speaker; verifying the second speaker as the speaker when there is a match between the set of topological indices for the second speaker and the set of topological indices for the speaker; and identifying the second speaker as a person different from the speaker when there is not a match."

The Office (Action of May 30, 2008 at pages 5-6) asserts that Yuschik discloses each of claim 2's limitations. Applicants respectfully disagree.

Yuschik does not teach analyzing a voice sample from a second speaker to extract a set of topological indices for the second speaker. Yuschik (¶ 0031) discloses:

> [a] database 102 stores records 104, each record corresponding to a subscriber of the voicemail system. As shown in FIG. 2, each record 104 contains a voice template 200 of the corresponding subscriber's voice, the subscriber's voicemail box number 202 and other information 204 necessary for the operation of the voicemail system.

The above quoted portion of Yuschik does not disclose how to extract a set of topological indices for the second speaker. In fact, Yuschik fails to disclose any method for creating the voice templates stored in the database. Yuschik does not teach this because it is directed towards an improved access control system that combines known speaker-dependent and speaker-independent voice identification and verification techniques. *See* Yuschik (¶ 0014).

More specifically, Yuschik (¶ 0037) only suggests techniques based on "[f]eatures such as pitch, pitch rate change, high frequency captured, glottal waveform, and temporal duration of sound events." These techniques are based on metric rather than topological characteristics of the voice sample. Yuschik thus fails to disclose, suggest, or motivate how to extract a set of topological indices for the second speaker.

Accordingly, Yuschik does not teach, suggest, or motivate analyzing a voice sample from a second speaker to extract a set of topological indices for the second speaker.

Yuschik also does not teach comparing the set of topological indices for the second speaker to the set of topological indices for the speaker. Yuschik (¶ 0034) discloses:

> "[a] comparator 120 compares the calculated voice template 118 to each of the retrieved voice templates 116. If the calculated voice template 118 matches one of the retrieved voice templates 116 within the acceptance limits specified by the Type I and Type II error thresholds, the user 106 is considered identified and verified."

Yuschik does not disclose how to actually compare the voice templates. The techniques Yuschik (¶ 0037) suggests are based on metric rather than topological characteristics. In fact, the words "topology" and "topological" are not even used in Yuschik. Furthermore, ¶0034 itself demonstrates Yuschik did not contemplate comparing topological indices because the matching relies on thresholds. A voice identification and verification system using topological properties has many advantages, one of which is that "using topological tools developed in a different field for dynamical systems" creates "voiceprints that stand on their own, despite any acceptance/rejection thresholds." The written description of the present application (¶¶ 0032-35) discloses that one of the advantages of topological indices is that matching no longer requires error thresholds.

Accordingly, Yuschik does not teach, suggest, or motivate comparing the set of topological indices for the second speaker to the set of topological indices for the speaker.

In another aspect, Yuschik does not teach verifying the second speaker as the speaker when there is a match between the set of topological indices for the second speaker and the set of topological indices for the speaker. Yuschik (¶ 0034) discloses:

> "[a] comparator 120 compares the calculated voice template 118 to each of the retrieved voice templates 116. If the calculated voice template 118 matches one of the retrieved voice templates 116 within the acceptance limits specified by the Type I and Type II error thresholds, the user 106 is considered identified and verified."

Once again, Yuschik does not disclose how to actually identify a match between two voice templates. Thus, Yuschik does not disclose, suggest, or motivate how to determine if there is a match between the set of topological indices for the second speaker and the set of topological

indices for the speaker because it does not teach any specific way of matching or disclose that matching topological indices for two speakers is possible.

For at least these reasons, claim 2 is patentable over Yuschik.

CLAIM 3

Claim 3 recites "the method as in claim 1, further comprising: extracting sets of topological indices from voices of different known speakers; analyzing a voice sample from an unknown speaker to extract a set of topological indices for the unknown speaker; comparing the set of topological indices for the unknown speaker to the set of topological indices for the known speakers to determine whether there is a match; and when there is a match, identifying the unknown speaker as a known speaker whose set of topological indices matches the set of topological indices for the unknown speaker."

The Office (Action of May 30, 2008 at 7-8) asserts that Yuschik discloses each of claim 3's limitations. Applicants respectfully disagree. Claim 3 depends from claim 1 and thus claim 3 is allowable for at least the reasons discussed with respect to claim 1.

In addition, Yuschik does not disclose or suggest extracting sets of topological indices from voices of different known speakers as recited in claim 3. Applicants respectfully direct the Examiner to the arguments made on this point for claim 2.

Yuschik also does not disclose analyzing a voice sample from an unknown speaker to extract a set of topological indices for the unknown speaker. Yuschik (¶ 0009) discloses:

> [t]he parameters of a voice template quantify certain biometric characteristics of the speaker's voice, such as amplitude, frequency spectrum and timing, while the speaker utters the predetermined word or phrase.

Yuschik does not disclose or suggest how to extract a set of topological indices for the unknown speaker. For example, Yuschik does not disclose taking an embedding of spectral functions. Yuschik does not teach this because it only suggests using metric properties of the utterance in voice identification systems as discussed more fully in relation to claim 1. In fact, the words topology and topological are not even used in Yuschik.

Yuschik also fails to disclose, suggest, or motivate comparing the set of topological indices for the unknown speaker to the set of topological indices for the known speakers to determine whether there is a match. Yuschik further fails to disclose, suggest, or motivate identifying the unknown speaker as a known speaker whose set of topological indices matches the set of topological indices for the unknown speaker when there is a match. Applicants respectfully direct the Examiner to the arguments made on these points for claim 2.

For at least these reasons, claim 3 is patentable over Yuschik.

Rejection Under 35 U.S.C. § 103

Claims 4-7, 9-10, and 23-26 stand rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over Yuschik in view of United States Patent No. 5,313,556 to Parra (hereinafter "Parra"). Claim 8 stands rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over Yuschik in view of Parra and United States Patent Ser. No. 2002/0147588 A1 by Davis et. al. (hereinafter "Davis"). Applicants respectfully disagree. Claims 4-10 depend from claim 1 and thus are allowable for at least the reasons discussed with respect to claim 1.

CLAIM 4

Claim 4 recites "[t]he method as in claim 1, further comprising: storing the set of topological indices for the speaker in a portable device; obtaining a voice sample from a user in possession of the portable device; analyzing the obtained voice sample from the user to extract a set of topological indices for the user; providing a reader device to read the set of topological indices for the speaker from the portable device; comparing the set of topological indices for the speaker read from the portable device and the set of topological indices for the user to determine if there is a match; and identifying the user as the speaker when there is a match."

The Office (Action dated May 30, 2008 at 9-13) asserts that the combination of Yuschik and Parra teaches all the elements of claim 4. Applicants respectfully disagree.

Yuschik and Parra in combination as contended by the Office (Action dated May 20, 2008 at page 11) fail to disclose analyzing the obtained voice sample from the user to extract a set of topological indices for the user. Yuschik is completely silent with respect to topological

indices extracted from a voice sample; Applicants respectfully direct the Examiner to the arguments made on this point for claim 2.

Furthermore, Parra also fails to provide support for the Office's contention. Parra at col. 49-53 discloses:

> [a]t the point of use, the card holder is requested to speak his or her name which is transduced to electrical signals, digitized and compared against a stored digital rendition using the principles of this invention.

Parra does not, however, disclose how to extract a set of topological indices or whether a voice sample even has topological properties. In fact, Parra focuses on the relationship between energy peaks and valleys of neighboring frequencies, stating that "[t]he distribution of these features in a small fraction of a second of the sound wave constitutes a code unique to each individual." Parra at col. 7:47-50.

Thus, Parra is another reference directed towards the metric rather than topological features of voice samples and does not teach, suggest, or motivate analyzing the obtained voice sample from the user to extract a set of topological indices. Just like in Yuschik, Parra does not even mention "topology" and "topological" in its disclosure and certainly does not provide the support to the contended rejections.

The Office (Action of May 30, 2008 at 11) further asserts that Fig. 3 of Parra provides an image of topological information derived from a voice sample. Applicants respectfully disagree because "FIG. 3 is a three dimensional waveform showing time (y axis), frequency (x axis), and amplitude (z axis) and illustrates the valley/peak feature points used in the invention." Parra at col. 6:21-24. A time-frequency-amplitude waveform graph discloses metric properties, not topological properties. In addition, Parra does not teach, suggest, or motivate how to extract a set of topological indices from that waveform.

The combined teachings of Yuschik and Parra also fail to disclose comparing the set of topological indices for the speaker read from the portable device and the set of topological indices for the user to determine if there is a match. Parra at col. 2:46-53 discloses:

> [t]he digitized portions of the card owner's name (for example) voice samples, prepared as described herein, are recorded on the magnetic strip of a credit bank,

> or charge card. At the point of use, the card holder is requested to speak his or her name which is transduced to electrical signals, digitized and compared against a stored digital rendition using the principles of this invention.

Parra at col. 3:51-55 further discloses:

> [t]he juxtaposition of the lines and curves in any one slice to those of its neighbors, disclosed by the cascade pattern of the acoustic hologram, constitutes the fabric of the processed voice sample, which is the basis for voice comparisons in the present invention. *See also* Parra at col. 44-51.

See also Parra at col. 44-51. Merely disclosing how to analyze this metric property of voice samples does not disclose, suggest, or motivate comparing the set of topological indices for the speaker read from the portable device and the set of topological indices for the user to determine if there is a match. Yuschik also does not disclose, motivate, or suggest this; Applicants respectfully direct the Examiner to the arguments made on this point for claim 2.

For at least these reasons, claim 4 is distinctly different from and patentable over Yuschik in view of Parra.

CLAIM 6

Claim 6 recites "[t]he method as in claim 5, wherein the portable device is a magnetic card and the set of topological indices for the speaker is stored in the magnetic card." The Office (Action of May 30, 2008 at 14-15) asserts that Yuschik in view of Parra teaches all the limitations of claim 6. Applicants respectfully disagree.

Parra at col. 2:46-53 discloses

> [t]he digitized portions of the card owner's name (for example) voice samples, prepared as described herein, are recorded on the magnetic strip of a credit bank, or charge card. At the point of use, the card holder is requested to speak his or her name which is transduced to electrical signals, digitized and compared against a stored digital rendition using the principles of this invention.

The Office (Action of May 30, 2008 at 14) asserts based on this disclosure and Parra as a whole that Parra teaches storing a set of topological indices on a magnetic card as a set of sub-audible portions of the total waveforms. However, Parra (col. 2:47-48) only teaches how to record voice samples "prepared as described herein," and Parra discloses preparing voice samples based on

very specific metric properties. Specifically, Parra at col. 7:59-62 discloses that "[a]ccording to this invention, a digital sonic profile produced as described above, corresponding to that of the card owner is recorded magnetic strip 30." And a sonic profile, according to Parra at col. 8:45-49, is created by "converting . . . said second digital electrical signals to a three domain format of frequency, amplitude and time samples to produce an array of peaks and valleys constituting a sonic profile." *See also* Parra at col. 3:38-57; 7:24-54. This array of peaks and valleys represents metric, not topological, information. Parra therefore fails to disclose how the set of topological indices for the speaker is stored in the magnetic card.

In addition, Yuschik is completely silent about topological indices as discussed above and thus cannot fill in the teachings absent from Parra. The combination of Yuschik and Parra therefore does not teach, suggest, or motivate that the set of topological indices for the speaker is stored in the magnetic card.

For at least this reason, claim 6 is patentable over Yuschik in view of Parra.

CLAIM 7

Claim 7 recites "The method as in claim 6, wherein the magnetic card comprises a magnetic strip that stores the set of topological indices for the speaker." The Office (Action of May 30, 2008 at 15) asserts that Yuschik in view of Parra teaches all the limitations of claim 7. Applicants respectfully disagree and direct the Examiner to the arguments made on this point for claim 6. For at least this reason, claim 7 is patentable over Yuschik in light of Parra.

CLAIM 23

Claim 23 recites "a speaker recognition system, comprising: a microphone to receive a voice sample from a speaker; a reader head to read voice identification data of rational numbers that represent a known speaker from a portable storage device; and a processing unit connected to the microphone and the reader head, the processing unit operable to extract topological information from the voice sample from the speaker to produce topological rational numbers from the voice sample and to compare the rational numbers of the known speaker to the

topological rational numbers from the voice sample to determine whether the speaker is the known speaker."

The Office (Action of May 30, 2008 at 17-20) asserts that Yuschik in view of Parra teaches all the limitations of Claim 23. Applicants respectfully disagree.

The combined teachings of Yuschik and Parra fail to teach, suggest, or motivate a processing unit connected to the microphone and the reader head, the processing unit operable to extract topological information from the voice sample from the speaker to produce topological rational numbers from the voice sample and to compare the rational numbers of the known speaker to the topological rational numbers from the voice sample to determine whether the speaker is the known speaker.

First, the combined teachings of Yuschik and Parra fail to disclose a processing unit operable to extract topological information from the voice sample from the speaker to produce topological rational numbers from the voice sample. Parra at 7:63-8:4 discloses:

> When the card is presented for a prescribed activity requiring that the card carrier also be the card owner, the carrier is requested to speak a few words into the microphone 35, the electrical analog signal is amplified by amplifier 36 and converted to digital signals by analog-to-digital converter 37, and the digital signal is presented to sonic profile extractor 38 to produce a digital signal corresponding to the sonic profile illustrated in FIG. 3, which sonic profile is supplied to microprocessor 39.

However, Parra does not disclose how to extract topological information from the voice sample. Parra at col. 8:45-49 discloses that the invention creates a sonic profile by "converting . . . said second digital electrical signals to a three domain format of frequency, amplitude and time samples to produce an array of peaks and valleys constituting a sonic profile." *See also* Parra at col. 3:38-57; 7:24-54. This array of peaks and valleys represents metric, not topological, information. Parra therefore fails to disclose how to extract topological information through a processing unit. Applicants reiterate that Yuschik also fails to disclose how to extract topological information from a voice sample because Yuschik (¶ 0037) only contemplates systems analyzing metric properties of spectral functions.

The combined teachings of Parra and Yuschik also fail to teach, suggest, or motivate how to produce topological rational numbers from the voice sample. The Office (Action of May 30, 2008 at 20) misunderstands claim 23 when it asserts that any topological information represented in digital form is inherently composed of rational numbers. The written description of the present application (¶ 0047) discloses that "the sizes of digital files for such rational numbers are relatively small when compared to usually large voice data banks for the spectral features in spectral analysis methods." This advantage is lost if claim 23 refers to the physical representation of the topological information rather than the logical data structure used.

Thus, the combination of Yuschik and Parra fails to teach, suggest, or motivate a processing unit operable to extract topological information from the voice sample from the speaker to produce topological rational numbers from the voice sample. In fact, the words "topology" and "topological" are not even used in either Yuschik or Parra.

Second, the combined teachings of Yuschik and Parra fail to disclose how to compare the rational numbers of the known speaker to the topological rational numbers from the voice sample to determine whether the speaker is the known speaker. Parra at col. 8:4-11 discloses

> Card 30 is passed through slot 40S of card reader 40, which reads the digitally coded sonic profile off of the magnetic strip and supplies same to microprocessor 39 for comparison and, depending on the results of the comparison actuating utilization of device 41, which may be a signaling device to indicate a correlation or non-correlation and the identity which has been stored in the file voice file with the sonic profile.

As disclosed by Parra at col. 7:31-54, sonic profiles contain frequency distribution information. This is a metric property, not topological information. Parra is therefore silent regarding how to compare topological information generally and how to compare topological information represented through rational numbers specifically. Applicants also reiterate that Yuschik fails to disclose how to compare topological information; Applicants respectfully direct the Examiner to the arguments made on these points for claim 2.

Thus, the combined teachings of Yuschik and Parra fail to teach, suggest, or motivate how to compare the rational numbers of the known speaker to the topological rational numbers from the voice sample to determine whether the speaker is the known speaker.

For at least these reasons, independent claim 23 is patentable over Yuschik in view of Parra. Claims 24-26 depend from claim 23 and thus are patentable for at least the reasons discussed with respect to claim 23.

Concluding Comments

The foregoing comments made with respect to the positions taken by the Examiner are not to be construed as acquiescence with other positions of the Examiner that have not been explicitly contested. Accordingly, the above arguments for patentability of a claim should not be construed as implying that there are not other valid reasons for patentability of that claim or other claims.

In view of the above remarks, claims 1-26 are in condition for allowance and a formal notice of allowance is respectfully requested. Please apply the fee of $25 for excess claims, and any other applicable charges or credits, to deposit account 06-1050.

Respectfully submitted,

Date: September 2, 2008

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